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111 SEAT No._____ SARDAR PATEL UNIVERSITY No. of Printed Pages : 2

M.Sc. (Electronics) Fourth Semester Examination (under CBCS)

March 2019

PS04CELE23: Sensor Technology

Saturday, March 23, 2019 **Time: 2.00p.m. to 5.00p.m.** **Total Marks: 70**

Q. 1 **Give the correct (nearest) answer (statement) to the following Multiple Choice Questions (Statements).** **8x1 = [8]**

(1) When measurements are subtracted the resulting worst error is
- (a) the sum of the percentage errors.
- (b) the sum of the errors.
- (c) the multiplication of the errors.
- (d) the difference of the errors.

(2) The communication using Michigan Serial standard (MSS) is
- (a) Full duplex
- (b) Half-duplex
- (c) simplex
- (d) none is correct

(3) The following function in a Semiconductor Gas sensor can be modified by introducing new material or addition of a dopant
- (a) Receptor
- (b) Transducer
- (c) Amplifier
- (d) All of these

(4) A rod of following is used as transducer in FOS Extrinsic Temperature Sensor:
- (a) Neodymium
- (b) Alexandrite
- (c) Ruby
- (d) All of the these

(5) In QCM, the oscillation frequency is
- (a) inversely proportional to the thickness of the crystal
- (b) directly proportional to the thickness of the crystal
- (c) exponentially proportional to the thickness of the crystal
- (d) none is correct

(6) In SAW, the IDTs are deposited on crystal
- (a) On the same side on the surface
- (b) On perpendicular sides
- (c) are perpendicular to each other
- (d) none is correct

(7) The straight-line plot of Reaction velocity vs substrate concentration is
- (a) Michaelis-Menton
- (b) Lineweaver-Burk
- (c) Michaelis
- (d) none is correct

(8) The most popular anisotropic etchant is
- (a) KOH
- (b) HF
- (c) Both (a) and (b)
- (d) None of these

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P.T.O.

Q. 2 **Give short answers to the following: (any seven)** **7x2 = [14]**

1. The potential difference measured across a Thermistor is 2.2 ±0.3 V and the current measured is 0.24 ±0.01A. What is the percentage error in the Resistance of a Thermistor?
2. Draw the block diagrams of 4^{th} and 5^{th} generation sensor systems.
3. Describe the role of 'Receptor' and 'Transduction' Mechanisms in a Gas Sensor.
4. Give the classification of Fiber Optic Sensors.
5. Mention the characteristic requirements of membrane in QCM.
6. Show the construction of SAW Magnetic Sensor.
7. Differentiate between voltametric and amperometric Transducers in Biosensors.
8. Show the construction of thin Diaphragm structure using Si Micromachining.
9. Mention advantages of Si sensors.

Q.3 (a) **With the required timing diagram, describe the interfacing of Michigan Parallel Bus Standard.** **[6]**

(b) **Define Dynamic parameters of measurement. Describe any two.** **[6]**

OR

(b) **What are the standards of measurement. Describe various standards in detail.** **[6]**

Q.4 (a) **What is a pellistor? Describe its working mechanism and mode of operation.** **[6]**

(b) **Describe the sensing mechanism and construction of metal oxide semiconductor gas sensors for the detection of reducing gases.** **[6]**

OR

(b) **Mention the advantages and drawbacks of Fiber Optic sensors. Describe the working of liquid level FOS.** **[6]**

Q.5 (a) **What is a surface acoustic wave device? Describe its working meachanism along with differential readout schemes.** **[6]**

(b) **Explain various modes of vibration in Piezoelectric sensor. Describe the working of Piezoelectric temperature sensor.** **[6]**

OR

(b) **With neat sketches describe the working of SAW Force Sensor.** **[6]**

Q.6 (a) **What is MEM? With neat sketch describe the working of MEM Accelerometer.** **[6]**

(b) **Using necessary equation describe the reaction of Enzymes with the substrate in Biosensors.** **[6]**

OR

(b) **Enlist various methods of Immobilization used in Biosensor. Describe any two.** **[6]**